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(54) Trailer/launching apparatus

(57) A boat trailer 1 has variable buoyancy units 3a, 3b, 3c and 3d so that the buoyancy of the trailer may be raised before the trailer and boat are launched into the water and so that the trailer floats with the boat. The buoyancy of the trailer is then lowered by lowering the buoyancy of units 3a, 3b, 3c, 3d until the trailer sinks leaving the boat floating on the water. The buoyancy units 3a, 3b, 3c, 3d may be connected to any convenient pressure source and, for example may be connected to a compressor driven from a vehicle engine. In an alternative embodiment a standard trailer and boat may be driven onto variable support means located at a launching site and the variable support means operated to lower the boat into the water whilst allowing the trailer to sink in a controlled manner. The trailer/launching apparatus may also be used to retrieve a boat from the water.

FIG. 1.

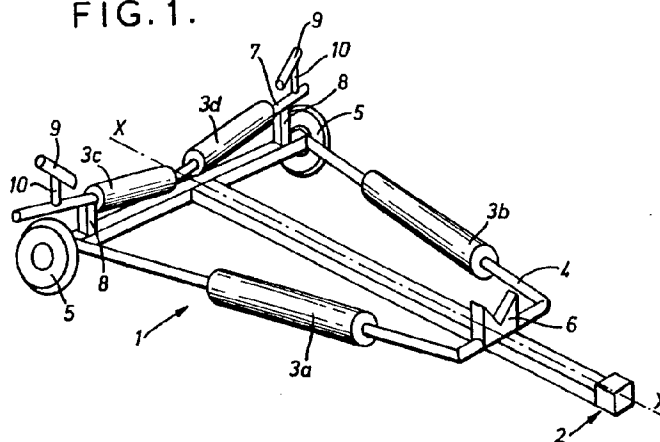
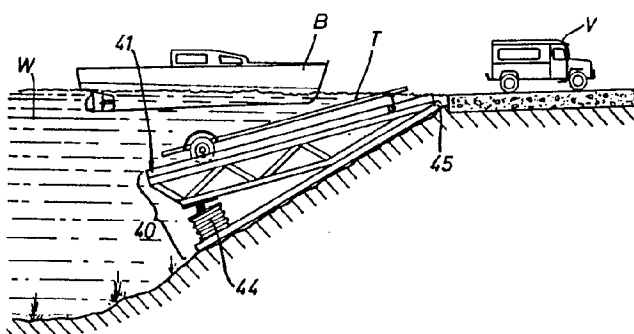


FIG. 11.



GB 2 156 744 A

FIG. 1.

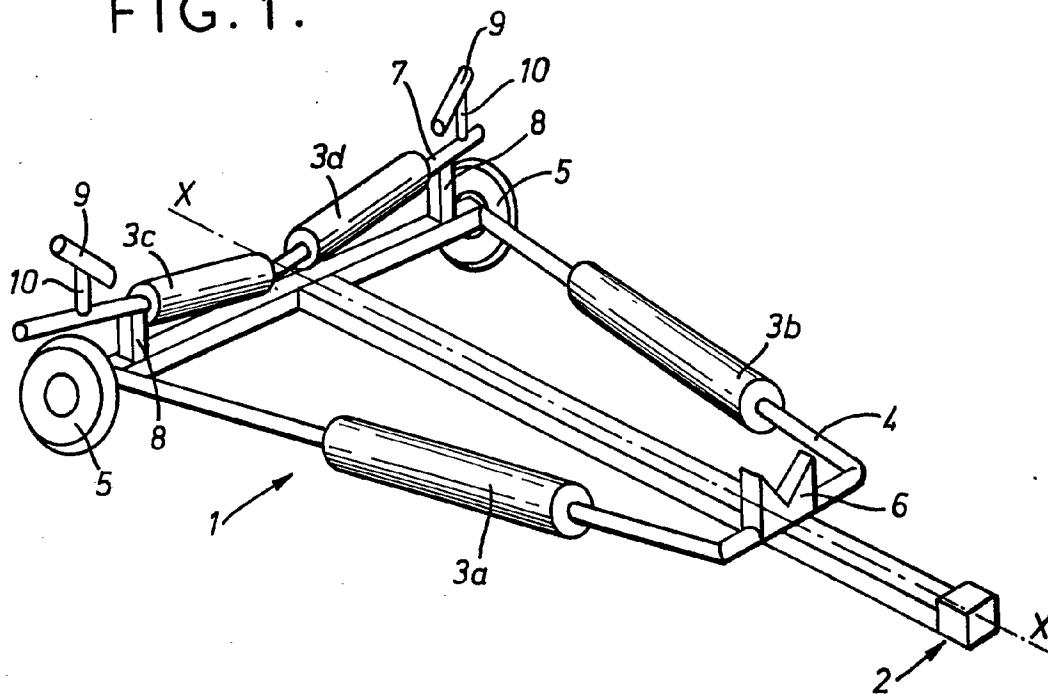


FIG. 3a.

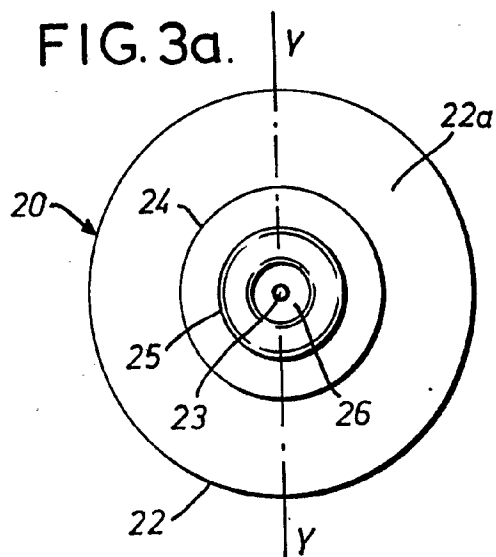


FIG. 3b.

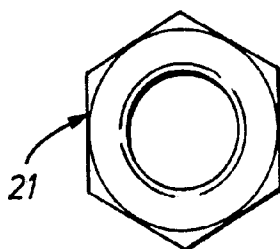
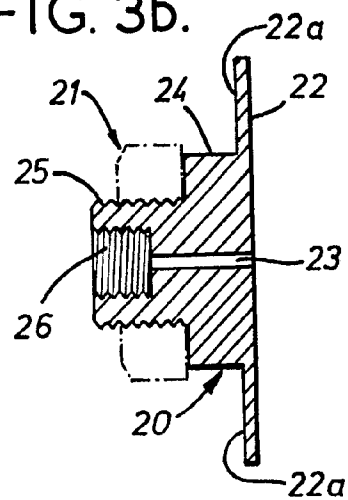
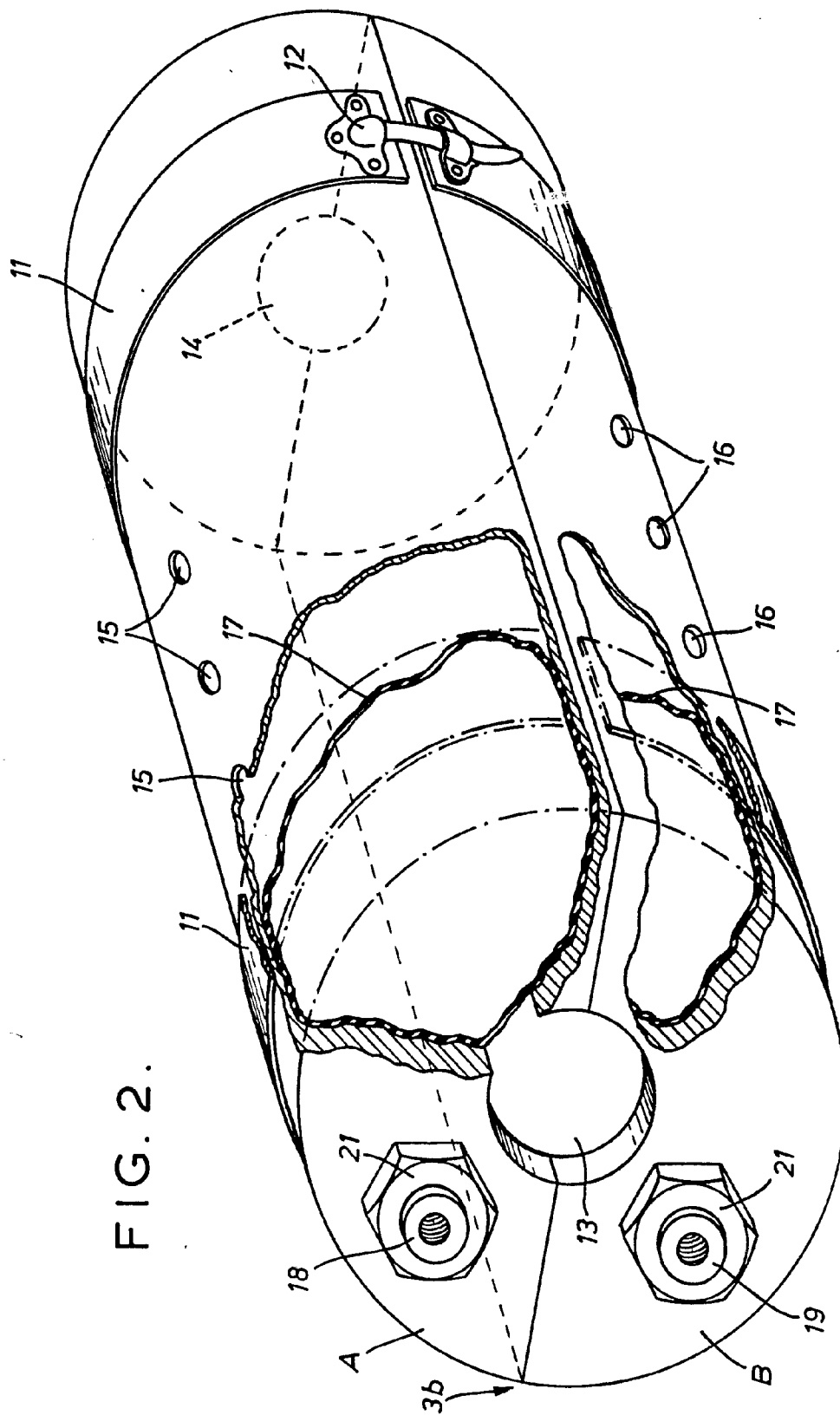


FIG. 3c.



3/15

FIG. 4.

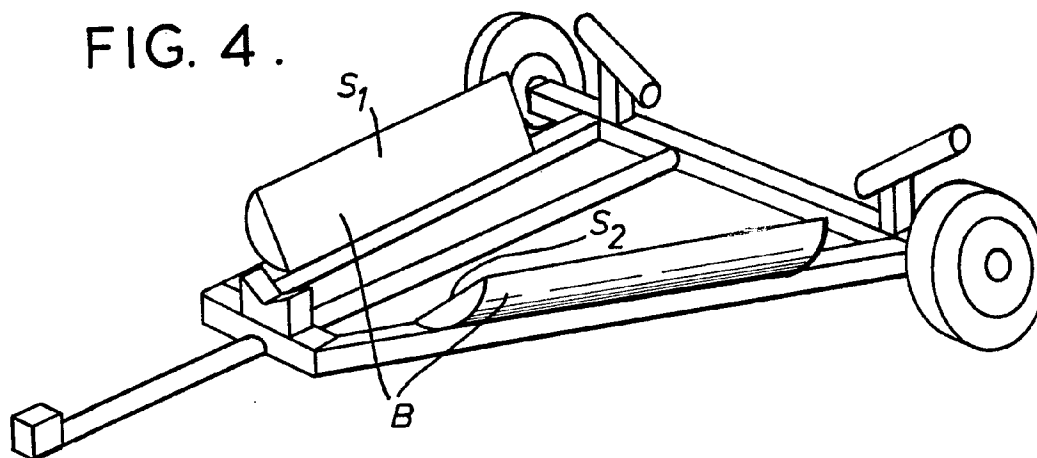


FIG. 5.

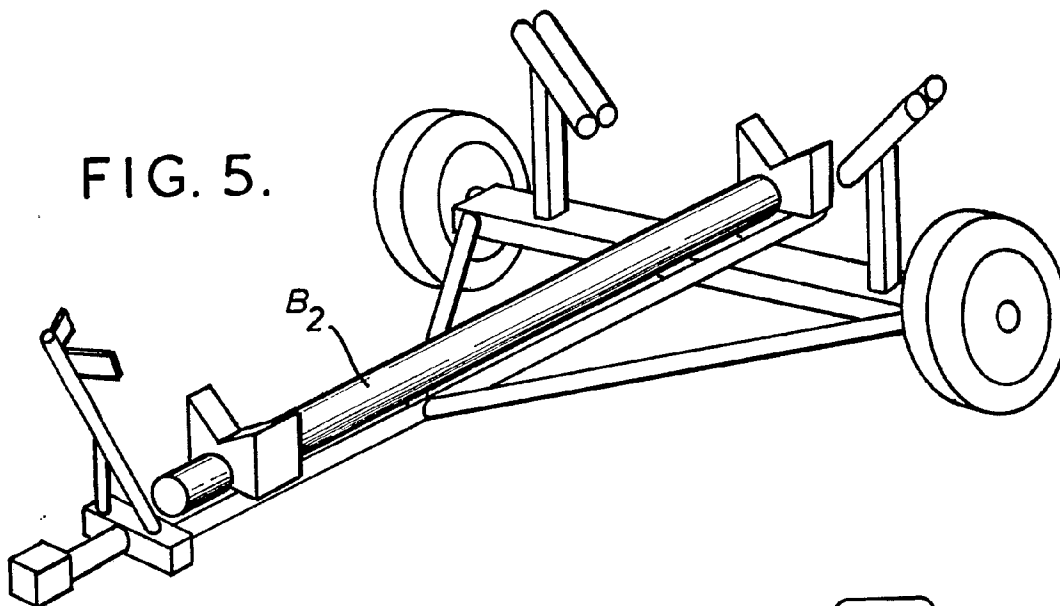
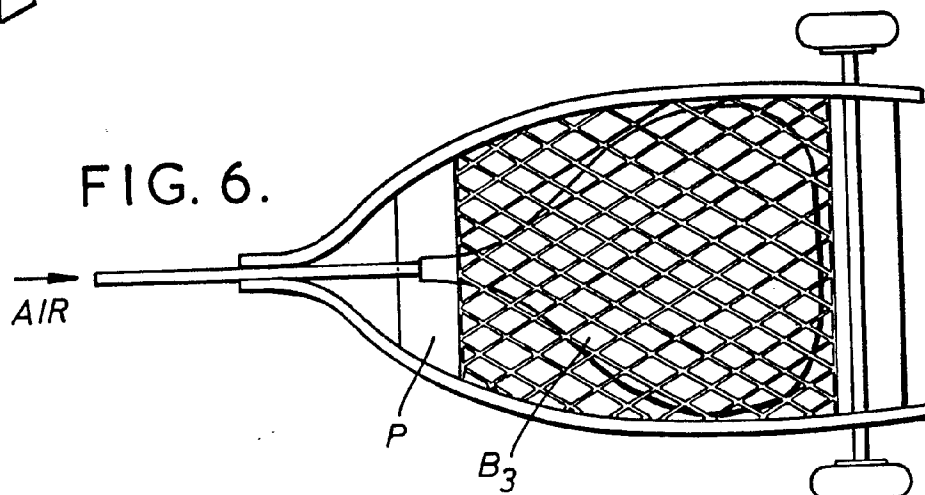


FIG. 6.



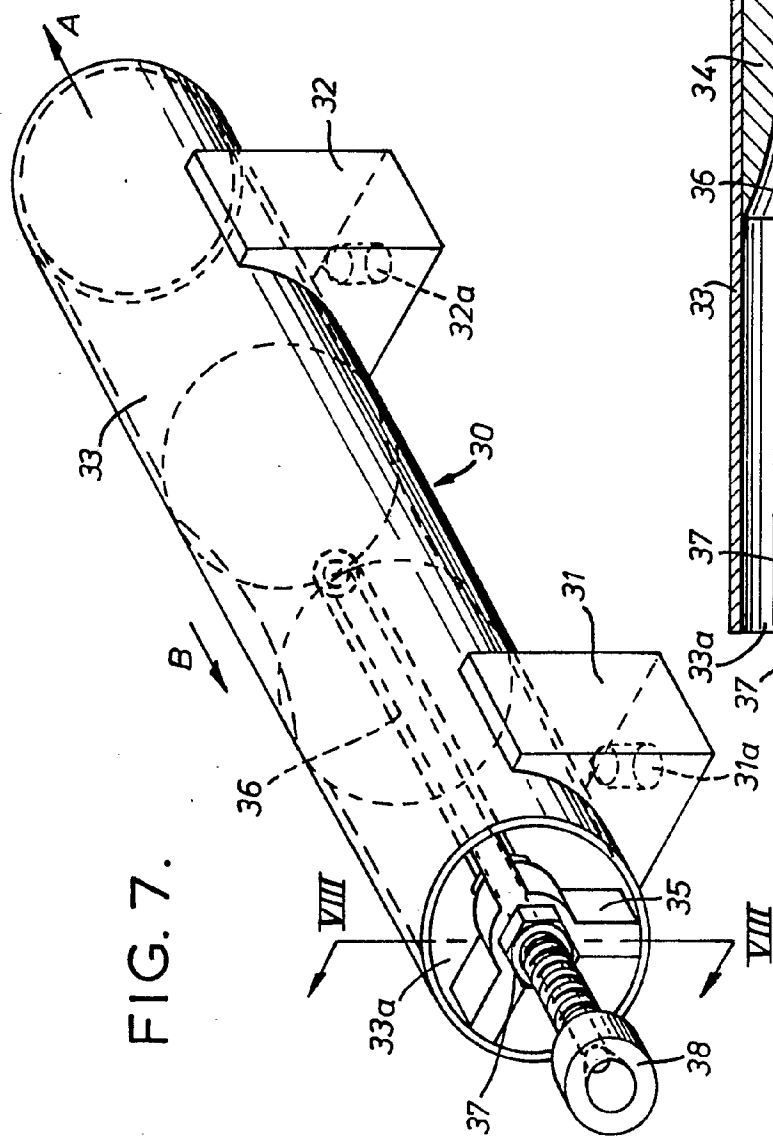
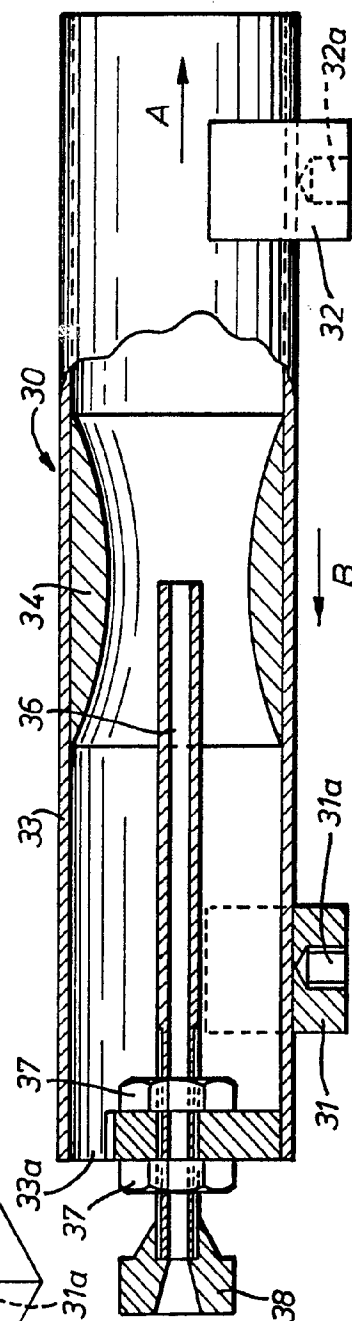


FIG. 8.



5/15

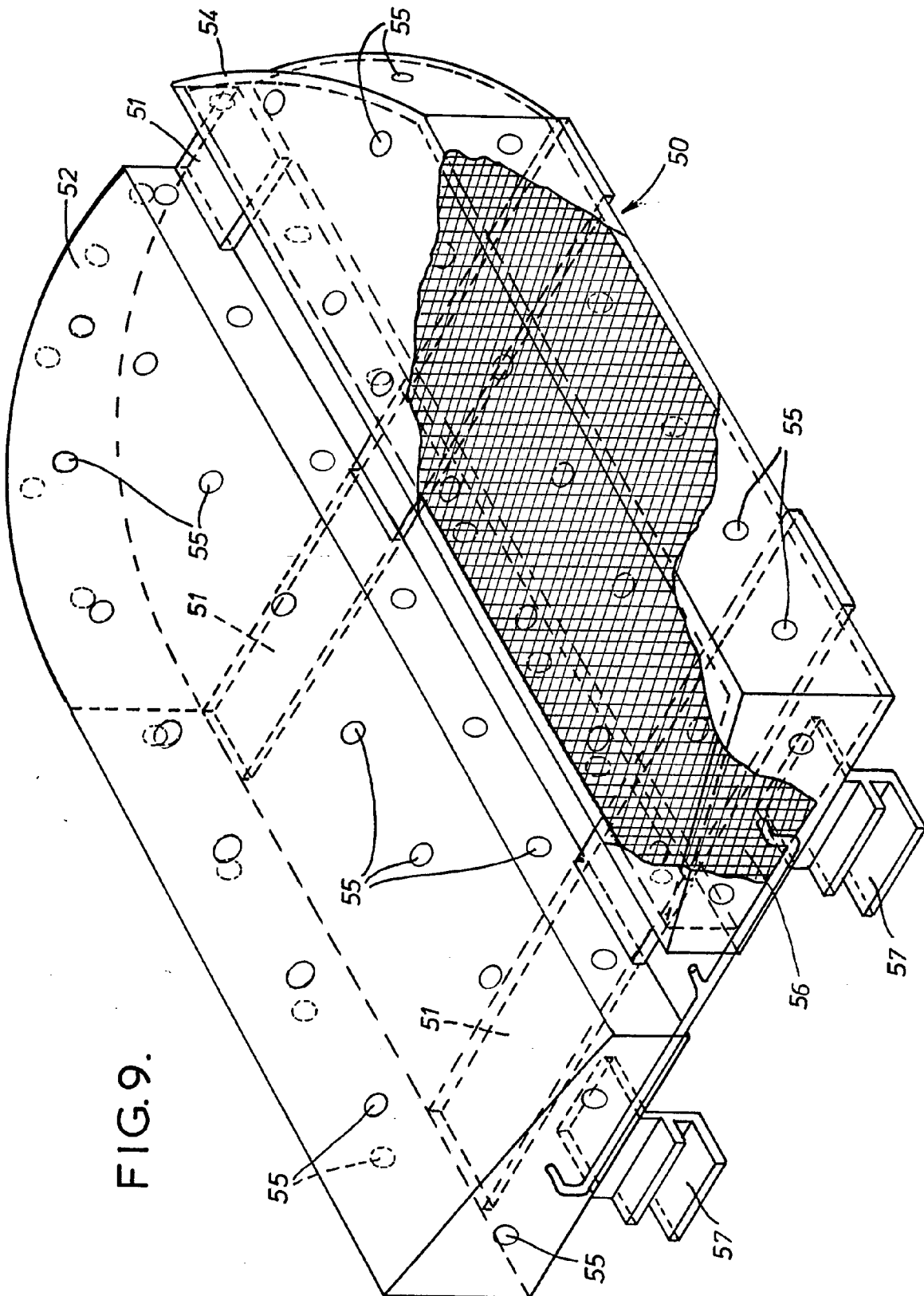


FIG. 9.

FIG. 11.

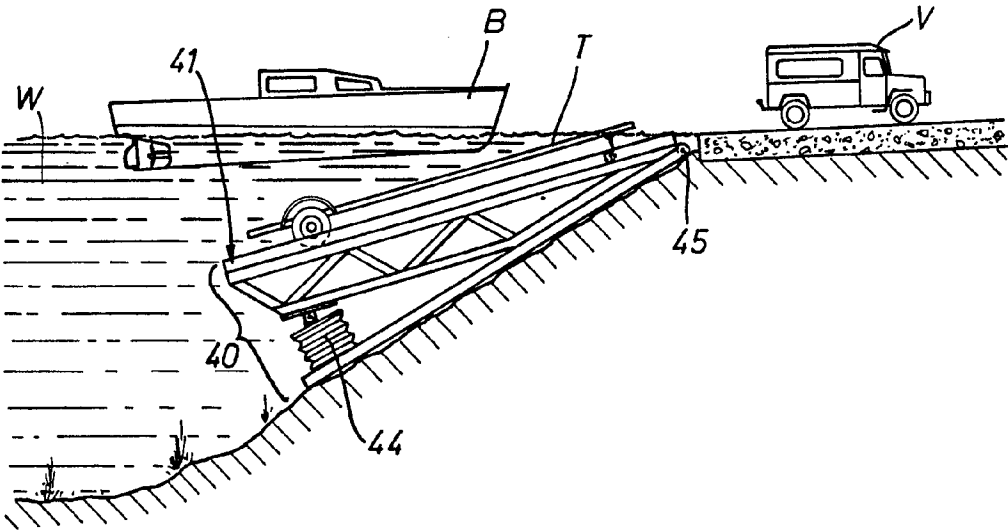
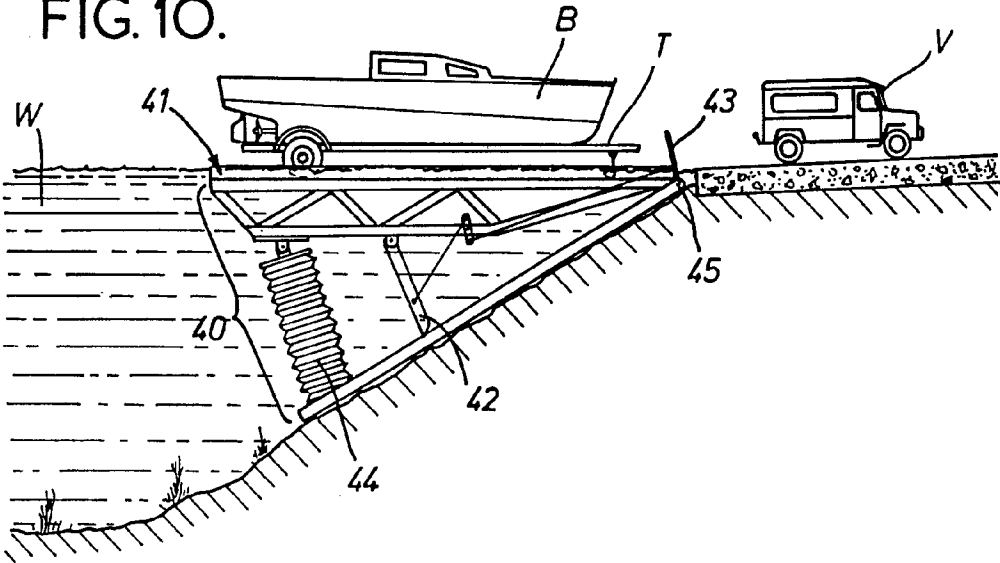
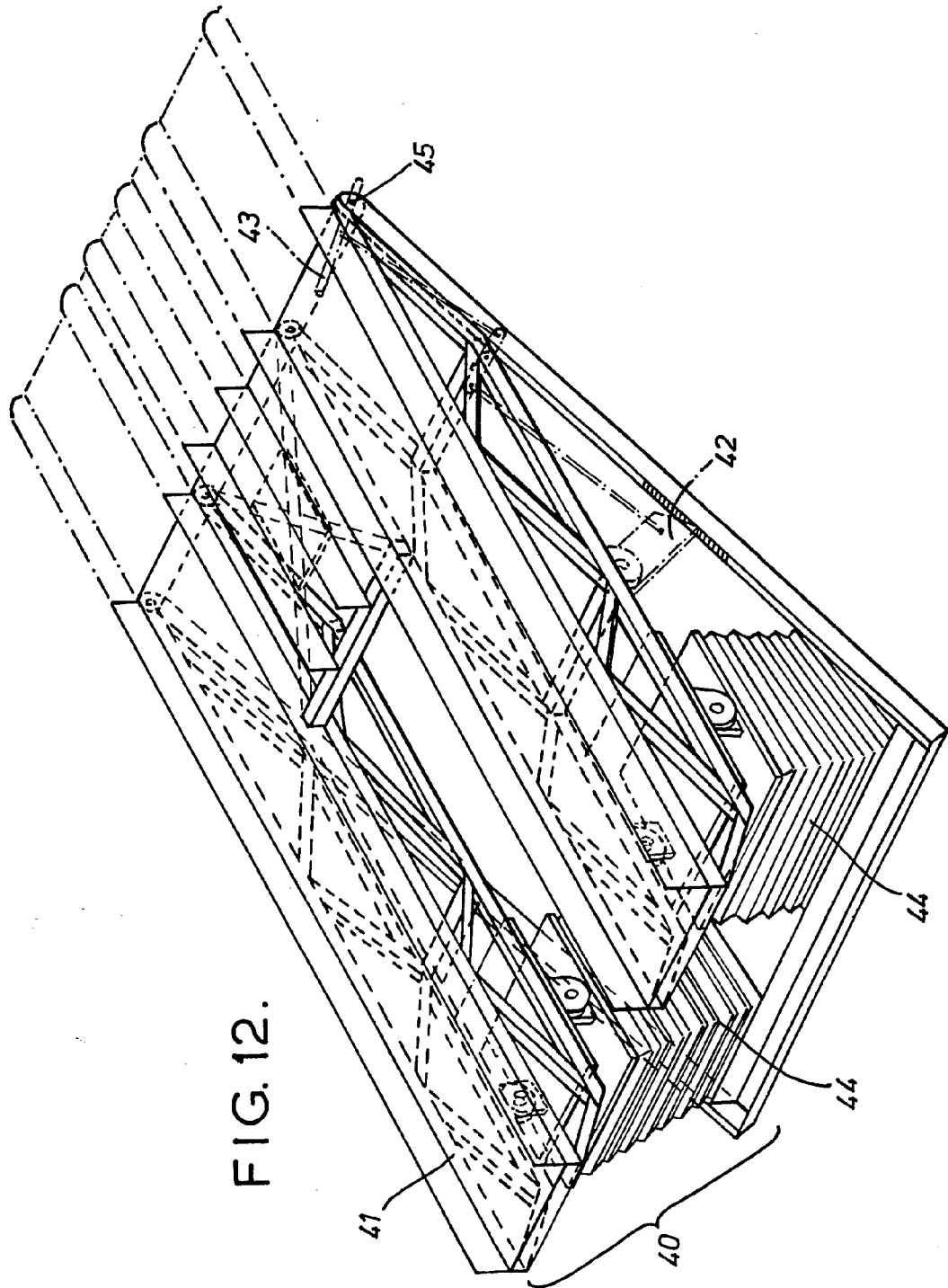


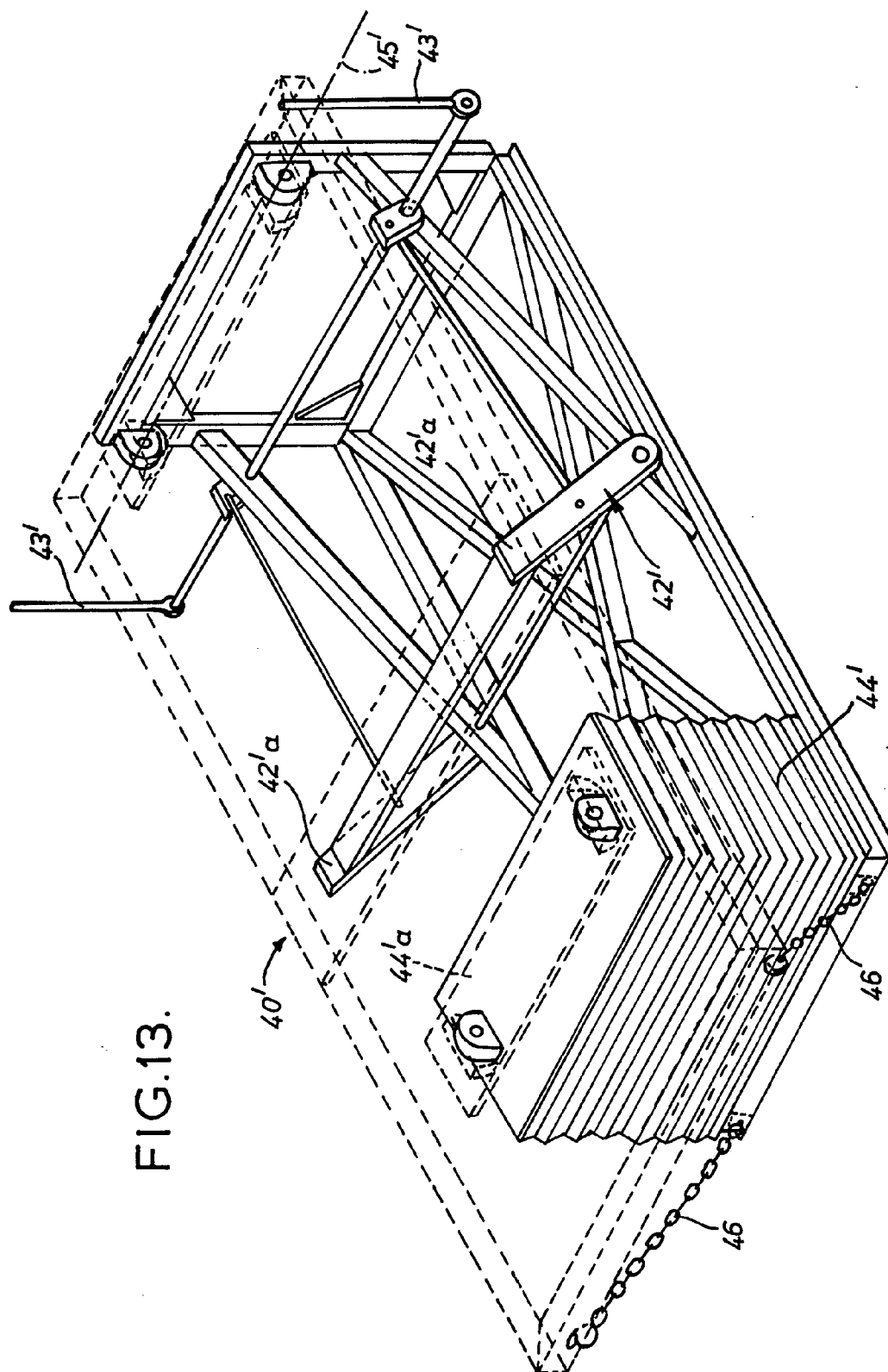
FIG. 10.



7/15



8/15



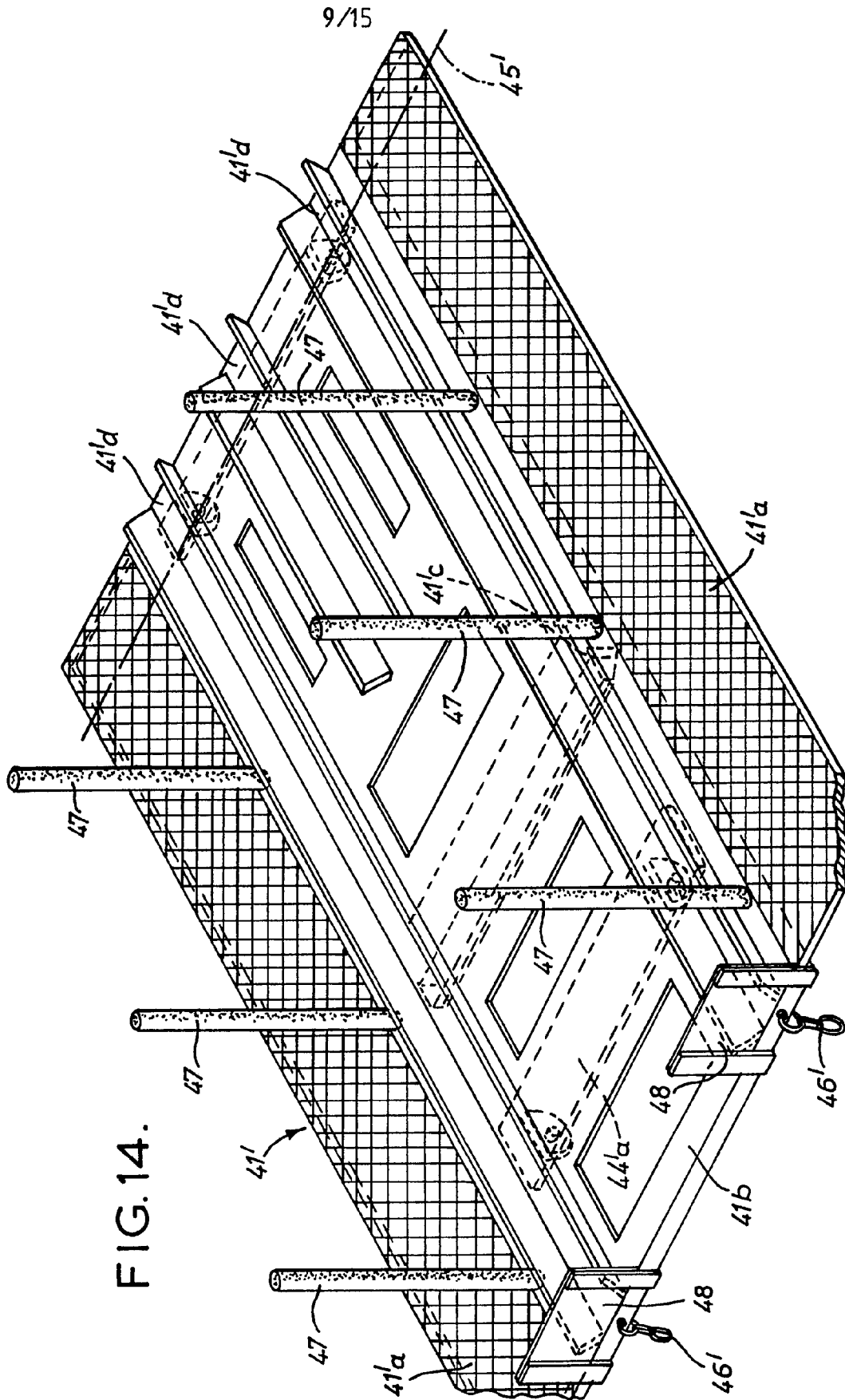
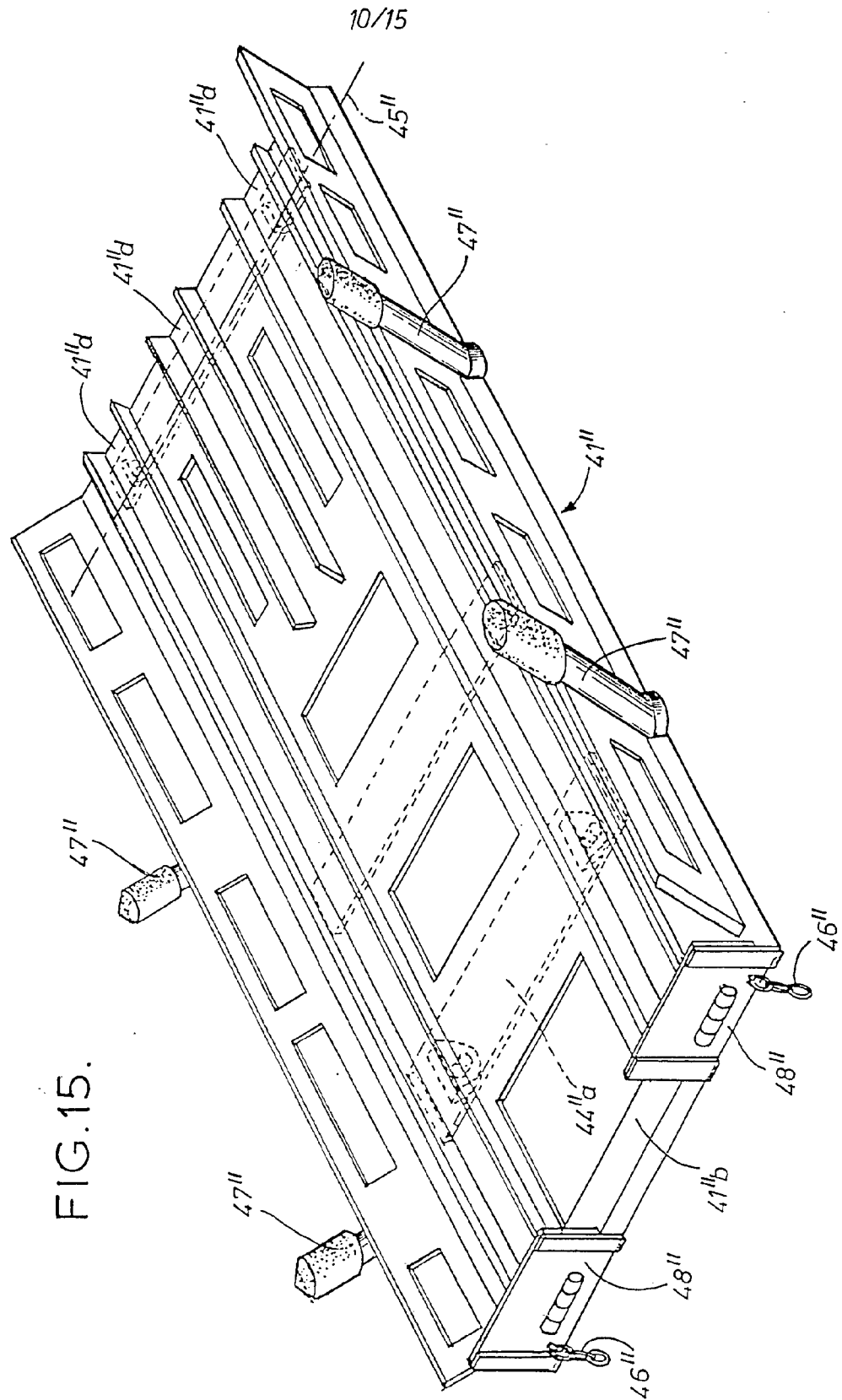


FIG. 14.



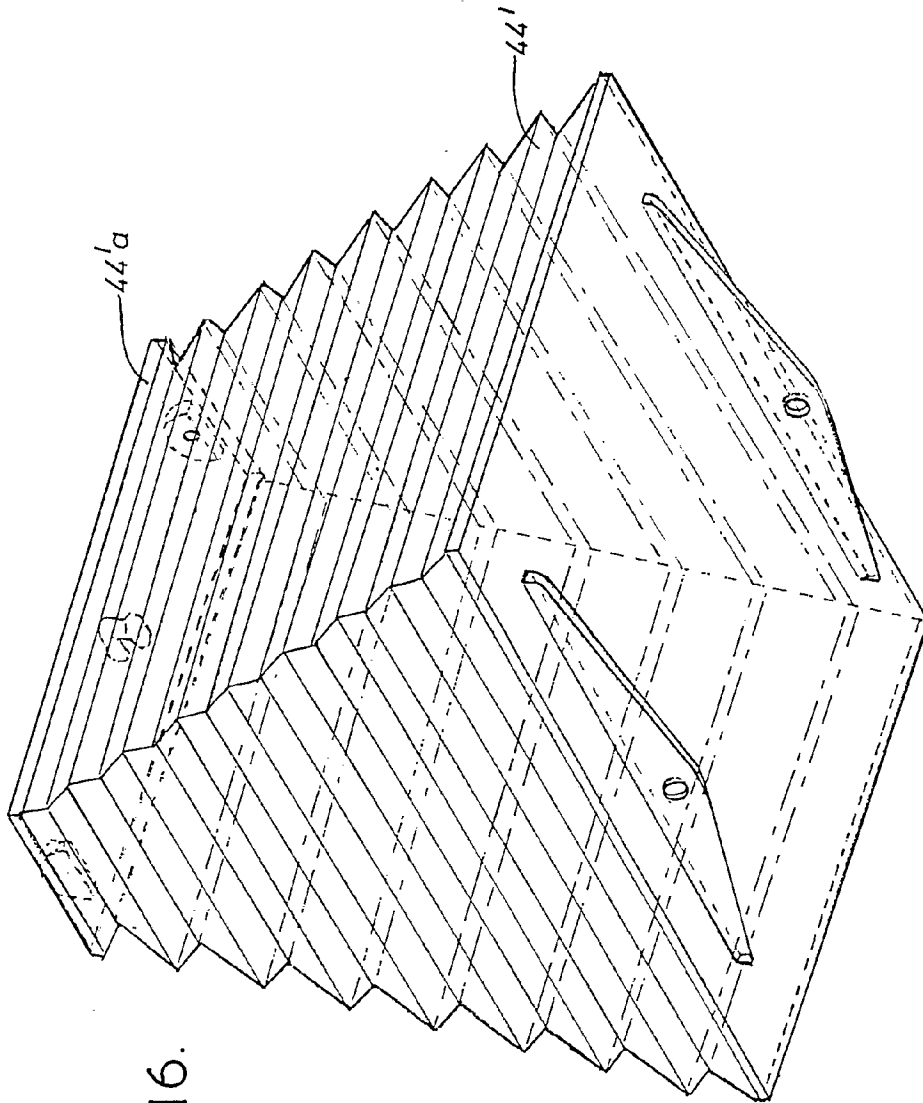


FIG. 16.

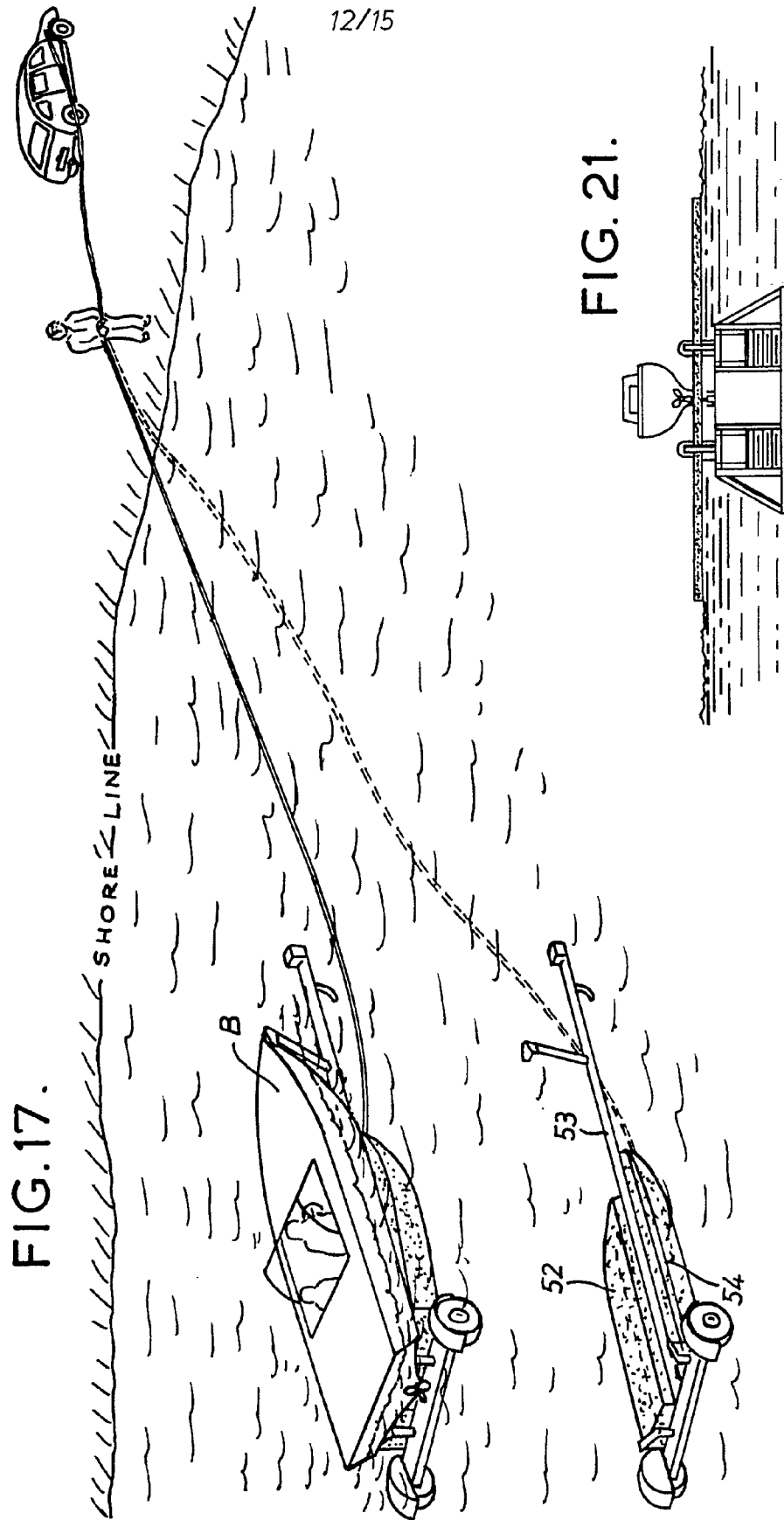


FIG. 18.

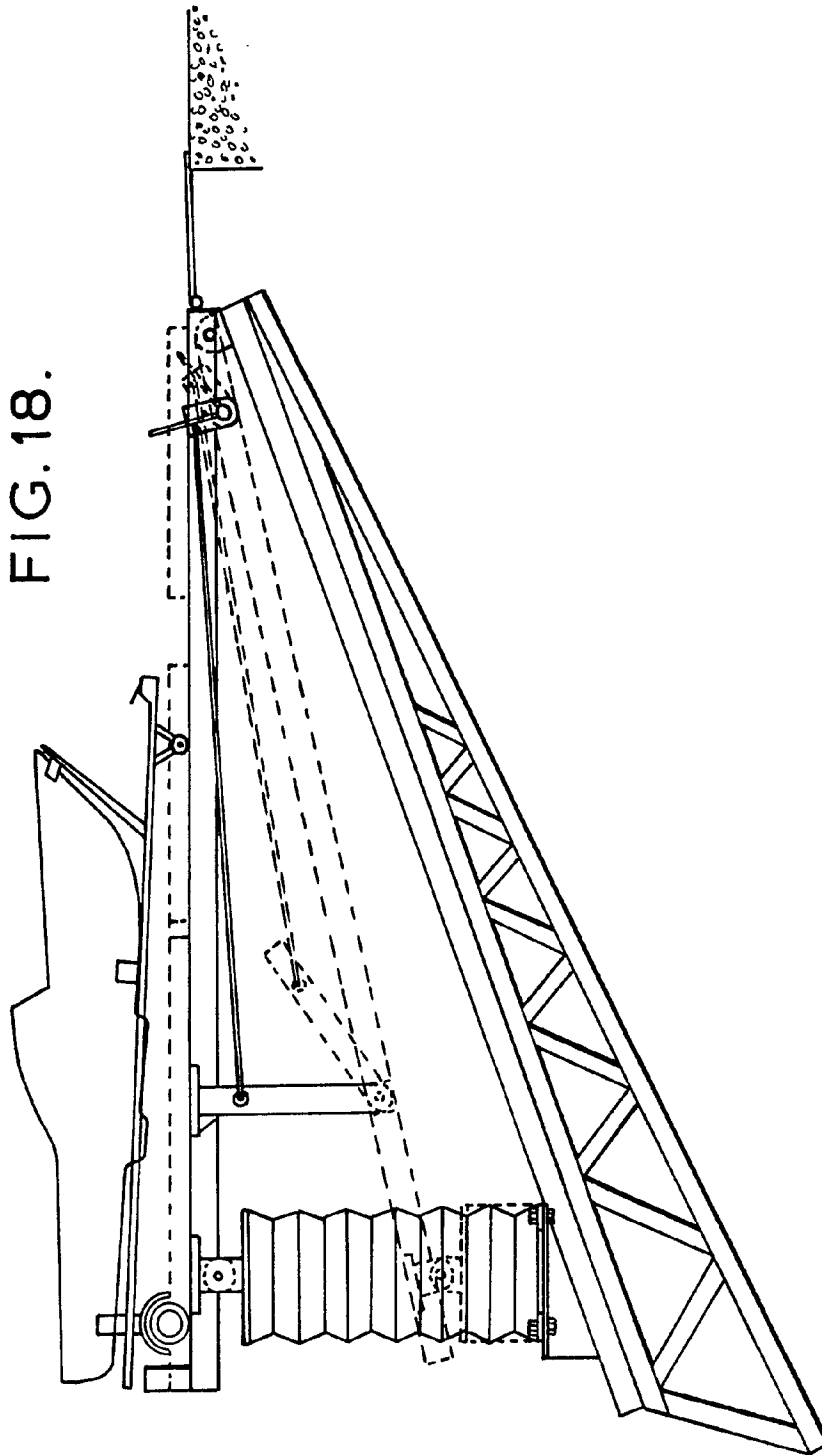
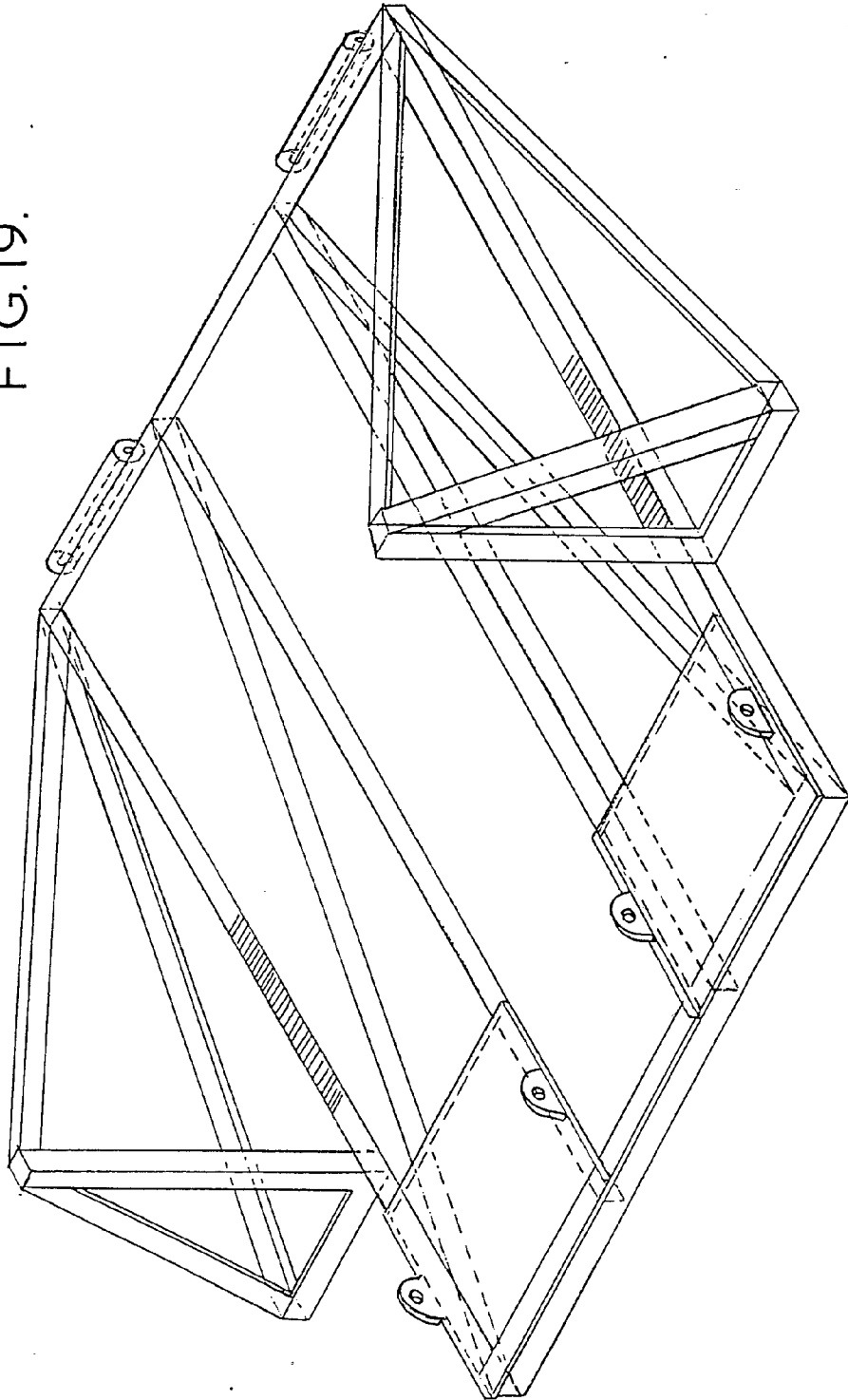
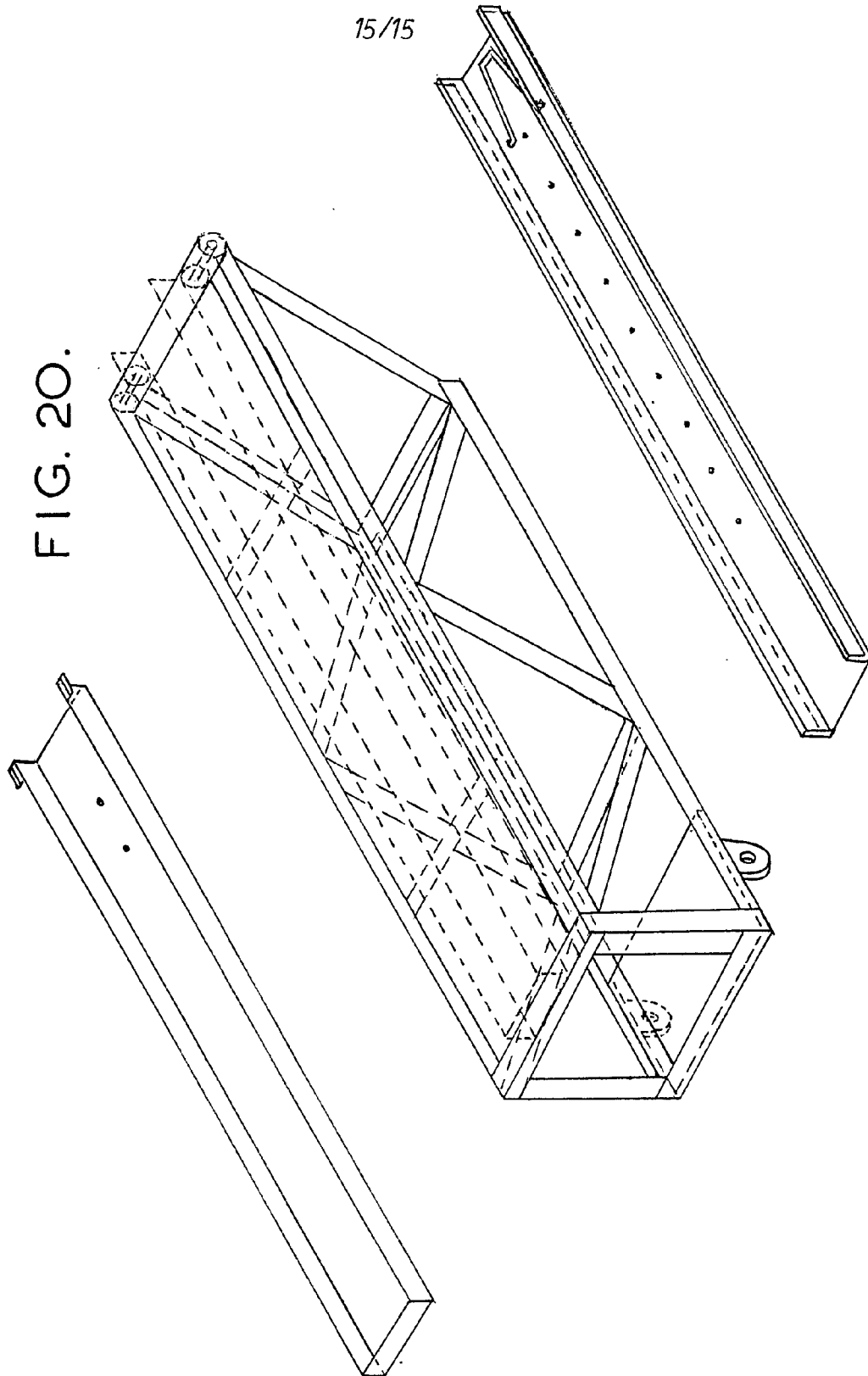


FIG. 19.



15/15



SPECIFICATION

Launching apparatus and trailer

- 5 This invention relates to a trailer for use in transporting a boat to and from a launching site and also to launching apparatus for launching the boat.

- It is known to transport boats on trailers which may be coupled to an appropriate vehicle, and boats may be launched into water from the trailer. However, difficulty is often encountered in manoeuvring the boat successfully into the water from the trailer. It is not unusual for the boat to be damaged during this operation, for example, by the supporting parts of the trailer piercing the hull and this problem is more acute for boats having fibre-glass hulls. Additionally, difficulty is often encountered in retrieving the boat from the water using the trailer and damage may also be done to the boat during this operation.

- It is an object of the present invention to alleviate the aforementioned difficulties.

- According to one aspect of the present invention there is provided a trailer for use in transporting a boat to and from a launching site, said trailer comprising variable buoyancy means, the arrangement being such that the buoyancy of the trailer is capable of being raised to a first level so that the trailer will float with a boat thereon during launching of the boat into water, and during launching the buoyancy of the trailer is capable of being lowered from the first level so that the trailer sinks leaving the boat floating on the water, said trailer also being utilisable to retrieve the boat from the water by manoeuvring the trailer at or below said first buoyancy level under the boat.

The term "boat" as used throughout this specification is intended to refer to any form of water borne craft.

- 45 Preferably, the variable buoyancy means comprises at least one buoyancy unit connected or connectable to a pressure supply system. The pressure supply system is to, preferably, lead in air to the or each unit to increase the buoyancy of the trailer and preferably, the or each unit comprises at least one inflatable balloon or bag, for example, of rubber material. The pressure supply system may be connectable to any suitable pressure source and conveniently may be connected to a compressor driven from a prime mover, for example, a motorised vehicle engine. Where more than one buoyancy unit is provided they are, preferably, interconnected so that they may be pressurised dependently, for example, in series or alternatively in parallel.

- Preferably, the trailer is adapted with guide means to help guide the trailer and boat relative to one another so that the boat may slip easily away from the trailer when required

(as in launching) and be guided onto the trailer when required (as in retrieving the boat from the water). The buoyancy unit or units may be configured to provide said guide

- 70 means. Additionally or alternatively where air is supplied to the or each unit expulsion of the air from the buoyancy unit or units may be directed by direction means, for example, jets to provide guide means. These jets may, for example, be located on each side of the trailer so that the trailer may be biased laterally in a controlled manner by air being expelled through selected ones of the jets. The trailer may be provided with a jet-air guidance system which operates independently of, or independently of part of, the buoyancy units.

- Where the or each buoyancy unit comprises at least one inflatable balloon as aforesaid, preferably it comprises an outer casing, preferably, of rigid material, for example plastics surrounding the respective inflatable balloon or balloons and delimiting the extent to which said balloon may be inflatable thereby preventing the balloons from bursting. Preferably, the or each casing is split into at least two releasably-lockable portions. The releasable locking may comprise one or more straps wrapped around the respective casing to strap the portions together. Appropriate locating means may be provided to locate the or each buoyancy unit to the remainder of the trailer, for example, onto a frame member of the trailer. The location means may comprise a hole extending into the interior of the casing into which part of the trailer for example, a frame member may be inserted.

- In one embodiment of the present invention four buoyancy units are provided to receive the hull of a boat, but more or less units may be provided to meet buoyancy and design requirements. Additionally, permanent buoyancy means such as plastics foam floats may also be provided on the trailer to give some measure of buoyancy to the trailer. The floats may be included inside the buoyancy unit or units. Where the trailer is connected or connectable to an air pressure supply system as aforesaid this enables the time spent in raising the trailer to said first buoyancy level to be less, the permanent buoyancy means alone not being sufficient to enable the trailer to float in the water with the boat thereon.

- Preferably, where the or each buoyancy unit includes a casing as aforesaid holes or valves are provided with the ingress and exhaust of water near the or each inflatable balloon so that water may be used to aid or accelerate reduction in buoyancy of the trailer from said first level by pressurising the or each balloon externally and expelling air therefrom. Advantageously, the each buoyancy unit may be provided with one or more connectors connecting the or each inflatable balloon to the pressure supply system and also securing the or each balloon to its respective casing.

The pressure supply system may include one or more manual valves such that once the trailer has been raised to said first level of buoyancy the valve or valves may be closed off, and manually opened again when required to reduce the buoyancy of the trailer. Automatic valve means may, alternatively, be provided. For example the buoyancy level of the trailer may be monitored so that in reaching the said first level of buoyancy the valve or valves are automatically closed by way of a pressure sensor. Alternatively, pressure gauges could be provided on the or each buoyancy unit so that the manual valve or valves could be switched on or off at appropriate pressure levels in the or each unit.

The automatic valve or valves may be controlled as required when the trailer is in the water and the water pressure itself may be used to do this.

The position of the buoyancy units relative to the remainder of the trailer may be adjustable so that selected portions of the trailer may be made variably buoyant, for example, in order to tilt one end of the trailer more easily in the water. It is an advantage of some embodiments of the invention that a boat may be launched into the water and retrieved there from using the trailer without having to handle the boat in the water. For example, in some embodiments the buoyancy of the trailer may be controlled by a person standing on land operating a valve or valves connected to the air supply system. Alternatively such valve or valves may be operated by a person actually on the boat.

Further according to the invention there is provided a variable buoyancy unit which is capable of being attached to, for example, a boat trailer, said unit being connected or connectable to a pressure supply system connectable to a pressure source so that the buoyancy of the unit may be raised on increase of the pressure from the pressure source, said unit comprising a shell or casing (for example two rigid casing portions releasably-lockable together) and at least one inflatable balloon securable or secured inside said shell or casing and capable of being inflated to outer dimensions restricted by the internal dimensions of the shell or casing.

One or more buoyancy units may be attached to, for example, a boat trailer and preferably said units are interconnected and pressurisable in dependent manner. Preferably, the units comprise connectors securing the or each balloon both to a wall of the shell or casing and to the air supply system. Selected ones of the connectors may be used to couple units together by way of piping so that the units are pressurisable in dependent manner.

Conveniently, said releasably-lockable portions of the shell or casing are configured to clamp onto the trailer or other piece of equip-

ment as the portions are releasably locked together. The units may also be adjustable to allow some relative movement between the equipment and unit such as a sliding adjustment movement, so that a selected portion or portions of the equipment can be altered in buoyancy.

Preferably, the buoyancy unit comprises two inflatable balloons and one of these may act as a failsafe and on its own can be utilised to provide sufficient buoyancy, in the event of the other failing to inflate.

According to another aspect of the present invention there is provided apparatus for launching a boat into the water comprising a trailer for use in transporting the boat to and from a launching site, the trailer having variable support means or at least being supported by variable support means of the apparatus during launching, the arrangement being such that during launching the trailer is supported at a first level in the water by the variable support means and then lowered into the water, the variable support means being adapted to gradually give less support to the trailer so that the trailer sinks leaving the boat floating on the water, said apparatus also being utilisable to retrieve the boat from the water.

The apparatus may comprise the trailer alone which has the variable support means or alternatively the trailer and boat may be driven or transported onto a launching pad or platform of variable support means conveniently located at a dockside, quay-side or marina, the variable support means in this instance remaining at the launching site and not being transported with the trailer and boat. In the former case the variable support means will usually be variable buoyancy means. The latter case is particularly applicable for the launching of heavier types of boats into the water.

Depending on the weight of the boat and trailer in some embodiments of the present invention it may be necessary or more practical to employ permanent buoyancy means in addition to variable buoyancy means.

Further according to the invention there is provided a method of launching a boat into the water comprising transporting the boat on a trailer to a launching site and supporting the boat in the water during launching on the trailer, the trailer being supported by variable support means which is either carried on the trailer or located at the launching site, the variable support means being controlled to gradually giving less support to the boat and trailer so that the trailer sinks leaving the boat floating on the water.

Further according to the invention there is provided a method of retrieving a boat from the water comprising manoeuvring the boat relative to a trailer which is submerged or partially submerged in the water, raising the

trailer up underneath the boat by controlling variable support means to gradually give more support to the trailer and then to the boat until the boat and trailer are supported at a first level and moving the trailer and boat together out of the water.

Further according to the present invention there is provided means for launching a trailer mounted boat comprising a launching support platform mounted to lower a boat and trailer into the water, said platform preferably being pivotally mounted, said launching platform being part of a variable support means and said variable support means being arranged to gradually vary the support given to the trailer and boat during launching of the boat into the water, said variable support means being connected or connectable to a varying pressure supply, for example an air-pressure or hydraulic fluid supply.

An embodiment of a trailer in accordance with the present invention will now be described, by way of example only, with reference to the accompanying simplified illustrated drawings in which:

Figure 1 shows a perspective view of the trailer;

Figure 2 shows a partly cut-away perspective view of a buoyancy unit of the trailer;

Figures 3a, 3b, 3c show a detail of a two-part connector of the buoyancy unit; *Fig. 3b* being a sectional view on the line Y-Y of *Fig. 3a*;

Figures 4, 5 and 6 show modified trailers;

Figures 7 and 8 show perspective and sectional side views of a directional control unit for the trailer; and

Figure 9 shows an alternative buoyancy unit.

An embodiment of apparatus for launching a boat into the water in accordance with the present invention will also be described, by way of example only, with reference to the accompanying simplified illustrative drawings in which:

Figures 10 and 11 illustrate the general principle of launching a boat into the water without providing variable buoyancy means on the trailer, the apparatus including variable support means located at a launching site;

Figure 12 shows the variable support means;

Figure 13 shows a modified form of the variable support means without its launching pad or platform for the boat;

Figure 14 shows a launching pad or platform of the variable support means shown in *Fig. 13*;

Figure 15 shows a modified launching pad or platform;

Figure 16 shows a modified bellows arrangement of the variable support means, and the remaining *Figs.* show further ideas and clarifications of the present invention.

Fig. 1 shows a trailer 1 intended for use in

transporting a boat to and from a launching site and is of a type having an end 2 suitable for coupling to the rear of a motorised vehicle.

Fig. 1 is only illustrated in simplified form to give a general picture of how buoyancy units 3a, 3b, 3c, 3d may advantageously be located relative to one another on a framework 4. The trailer has a pair of wheels 5 mounted on the framework 4 in a manner known per se. As should be evident from *Fig. 1* the trailer 1 is suitably shaped to receive the hull of the boat (not shown). The bow of the boat may be supported by a front V-shaped notch piece 6 arranged on the axis X-X of the trailer and the stern may be supported on a rear wide angle V-member 7 which is in turn supported above the frame 4 by short uprights 8. The stern may also be supported on either side thereof by short inclined supports 9 positioned above the V-member 7 by uprights 10 offset in a direction at right-angles to axis X-X from uprights 8.

The trailer 1 is symmetrical about its axis X-X, buoyancy unit 3a being identical with 3b and the units 3a, 3b being arranged on opposite sides of the frame 4, and buoyancy units 3c and 3d being identical and arranged transversely on either side of axis X-X on the V-member 7.

Fig. 2 shows one of the buoyancy units more specifically designated 3b but all the buoyancy units may be of identical or similar form. Each buoyancy unit may have its buoyancy varied in a manner described later on, in order to assist in launching or retrieving a boat from the water without damaging the boat.

Buoyancy unit 3b is generally tubular cylindrical and has a casing divided longitudinally into portions comprising two halves A and B, half A being located uppermost in *Fig. 2* and releasably-locked to half B. Each half A, B is made of rigid plastics but could be of other rigid material, and the two halves may be strapped together by suitable straps 11 (only two shown) located around the halves A, B and spaced axially along the buoyancy unit 3b. The ends of the straps 11 may be fastened together by any suitable means and in this instance are fastened together by newey clips 12 (only one shown). The ends of the buoyancy unit 3b are effectively closed except for circular holes 13, 14 whose axes lie on the axis of the unit 3b. Holes 13, 14 are to enable the unit 3b to be located by clamping on the frame 4 as shown in *Fig. 1* so that the respective frame member onto which the unit 3b is mounted passes axially through the unit 3b. The position of unit 3b along the frame member may be adjusted. The unit 3b is provided with a series of small open-ended holes 15, 16 arranged parallel to the axis of unit 3b. Holes 15 are arranged uppermost on half A and lead to the interior of the unit; holes 16 are arranged on half B as shown and

also lead to the interior of the unit 3b.

Arranged within the interior of unit 3b and within the space defined by halves A and B are two inflatable rubber balloons 17 which
 5 may be inflated to substantially fill the remaining space in the unit when the unit is mounted to the frame 4 as aforesaid. Connectors 18, 19 are provided at one end of unit 3b, connector 18 being on half A and connector 19 being on half B. Each connector 18,
 10 19 is attached to a respective rubber balloon 17 and to the respective end wall of the unit 3b. The connectors 18, 19 are for connecting the interior of the rubber balloons 17 with an air pressure supply system (not shown) to
 15 inflate balloons 17 and also to connect the air supply to the other buoyancy units 3a, 3c, 3d. The balloons 17 could, in some applications, be made of non-expandible material.
 20 A connector (for example, connector 18) is shown in more detail in Figs. 3a to 3c. As shown the connector consists of two individually formed parts, namely a base part 20 and a locknut 21.
 25 Base part 20 consists generally of co-axial cylindrical portions of varying diameter and has a flange 22 which is to be vulcanised to one of the rubber balloons 17. An axial hole 23 extends through the base part 20. The
 30 diameter of the base part 20 is stepped at 24 and this portion extends through a hole of similar diameter in half A or B respectively so that edge 22a engages the inner surface of said end wall of half A or B. Hexagonal
 35 locknut 21 may be secured onto less diameter portion 25 of base part 20 and tightened to engage the outer surface of the end of half A or B respectively. Holes are made in the
 40 rubber balloon 17 which may communicate with holes 23 and air may enter and exit from the balloon by way of holes 23, and the balloon is secured to the ends of halves A and B by the connectors 18, 19. An air-pipe (not
 45 shown) may be attached to open-end 26 of base part 20 via a screw thread plug to attach the balloon 17 to and from an air supply (not shown). One of the connectors (19, for
 50 example,) may also be connected to a similar connector on one of the other buoyancy units 3a, 3c, 3d, and so on so that all the buoyancy units 3a, 3b, 3c, 3d are linked to a
 55 common air supply by way of the connectors and appropriate piping and T-pieces (not shown).
 60 In order to inflate the rubber balloons 17 of each unit 3a to 3d the pipe leading air in to the connector 3b may be connected up to a compressor (not shown) driven from a prime mover such as a motorised vehicle engine (not
 65 shown) in a manner known per se (for example, as with pneumatic road diggers). Once the balloons 17 have been inflated so that the buoyancy units 3a to 3d are at an appropriate buoyancy level the amount of air
 in the units may be retained by closing one or

more valves (not shown) appropriately located in the air supply system, and the trailer may be disconnected from the prime mover.

In the example as described a manual valve
 70 is provided and once the balloons 17 have been sufficiently inflated (substantially when balloons 17 have been inflated to the internal dimensions of the halves A and B, for each unit 3a to 3d) this valve may be closed, so
 75 that the trailer and boat may be launched into the water. The buoyancy of the trailer 1 will be at a first buoyancy level such that trailer 1 floats on the water with the boat still on the trailer. This enables the boat to be more easily
 80 manoeuvred into the water and avoids the boat having to be awkwardly man-hauled off the trailer 1 into the water. The trailer and boat may be launched into the water by a person standing on land, for example a length
 85 of air supply hose could extend from the buoyancy unit or units to a valve operated by a person standing on land.

Once the trailer 1 and boat are floating in the water the manual valve may be opened
 90 allowing air to escape from the balloons 17. Additionally, or alternatively provision may be made to disconnect piping being appropriate ones of the connectors 18, 19 to release air from the rubber balloons 17. In this example,
 95 the water pressure itself is utilised to aid expulsion of air from the balloons 17 and increase the speed at which the buoyancy of the trailer 1 may be reduced to a level in which it begins to sink away from the boat to
 100 enable the trailer to be more easily manoeuvred away from the boat. Water can flow through holes 15 into the buoyancy units 3a to 3d and out through holes 16 to pressurise the outside of balloons 17 and help deflate them, to reduce the buoyancy of the trailer.
 105 Additionally, the expelled air could be directed selectively through air jets on each side of the trailer (not shown) to help guide the trailer relative to the boat. This may be particularly
 110 useful in retrieving the boat from the water.

In an alternative embodiment the connectors 18, 19 could be replaced by valves
 115 similar, perhaps, in operation to vehicle tyre valves so that air supply piping could be disconnected from these valves once the trailer is at the first buoyancy level. The buoyancy of the trailer could then be varied by a person actually on the boat. One or more
 120 of these valves could be selectively opened by suitable means to reduce buoyancy, or other valves may be provided on respective inflatable balloons which could be opened to allow the pressurising medium (air) to escape from selected balloons. This air could be directed
 125 through guide jets.

Figs. 4 to 6 show modified embodiments of the trailer. Only two buoyancy units are shown in Fig. 4 designated by B, and they are suitably shaped with flat sides S₁, S₂ angled
 130 towards the trailer axis to guide the boat on

and off the trailer.

Fig. 5 is provided with only one buoyancy unit B_2 .

Fig. 6 is a plan view showing a buoyancy unit B_3 in the form of an inflatable bag without an external plastics casing but with a containing mesh of non-expandable material. The unit is positioned underneath a platform P of the trailer.

The operation of these embodiments should be self-explanatory and will not, therefore, be described in further detail.

It is to be noted the trailer may be adapted to carry items other than boats, and the buoyancy units themselves may be utilised in any applications where it is desired to vary the buoyancy of equipment. One possible application may be in making caravans easier to handle.

Figs. 7 and 8 show perspective and sectional side views of a directional control unit 30 for attachment to a trailer or which may effectively be an integral part of the trailer. One or more of these control units 30 may be employed and preferably these such units are employed (one on either side of the trailer and one at the rear), the unit or units effectively providing a jet guidance system operable independently of the buoyancy system. The pressure source for the variable buoyancy system of the trailer may be the same source as for the directional control unit/s 30 and the pressures required will depend upon the weight of the trailer and boat. For example, the pressure fed to the directional control unit/s 30 may be 50–70 p.s.i., the pressure fed to the variable buoyancy means being 10–15 p.s.i. via a restrictor valve. The ratio of pressure fed to the buoyancy unit/s and the pressure fed to the directional unit/s may be similar in the case of varying trailer size. The size of the control unit/s 30 will depend upon the weight of the trailer. Figs. 7 and 8 show the unit 30 which is generally tubular cylindrical and open at each end. In this instance the unit 30 is of rigid plastics and has two mounting brackets 31, 32 provided with threaded holes 31a, 32a, for mounting the unit to a trailer. The brackets 31, 32 may be integrally moulded with the unit 30 or fixed thereto by convenient means such as by welding. The unit 30 has an open-ended cylindrical outer tube 33 and an inner co-axial centrally located venturi tube 34 fixed within tube 33 and extending about one third the length of tube 33. Tubes 33 and 34 may be secured together by any suitable means, for example, by welding or may be integrally formed.

A three-legged spider 35 spans the open end 33a of tube 33 which is the air input end of the tube 33a. Once again the spider 35 may be an integrally moulded part of the unit 30 or may be attached thereto by suitable means. The spider supports a pipe 36 which extends co-axially with tube 33 and extends

into the centre of the venturi tube 34. The pipe 36 is fixed to the spider 35 by two locknuts 37 which engage an outer threaded portion of pipe 36 as shown more clearly in Fig. 8 and the pipe 36 is provided with a snap-connector 38 for connecting the unit to a suitable pressure (air or gas) supply.

In use on a trailer the control unit 3 is initially submerged in the water on launching and water will enter pipe 36. In order to guide the trailer in the water air or other pressurising medium may be expelled from a suitable pressure source located above the water level by suitable actuating means (not shown) down the tube 36 thereby forcing water out of the tube so that the air or other pressurising medium enters the venturi tube 34 creating a jet thrust effect in direction of arrow A and driving the unit and trailer (depending of course on the orientation of the unit or units) in direction of B. Simultaneous or intermittent operation of a plurality of units 30 may be employed to manoeuvre the trailer in the water in manner which should readily be envisaged. Filters may be employed where required (for example over the open ends of tube 33) to avoid the unit 30 becoming clogged with weed, for example.

Fig. 9 shows an alternative buoyancy unit 50 which is configured to fit onto a standard type of trailer and which may be varied in dimensions to suit other types of trailers. Alternatively, this buoyancy unit 50 may form part of an integrated trailer design.

The unit 50 has three fish-plates 51 for attachment of the unit to the trailer. A standard trailer with the unit 50 affixed thereto is shown in Fig. 17. Unit 50 is a two-part unit in which one of the part 52 is arranged to lie on one side of the trailer draw bar 53 (see Fig. 17) and the other part 54 is arranged to lie on the other side of the draw bar 53. Parts 52 and 54 are mirror images of one another and each part 52, 54 comprises a fibreglass buoyancy float provided with an internal air-inflatable balloon 56 connectable up to an air-pressure supply. Each balloon 56 has a built-in (or integrally moulded) male bulkhead connector to required pipe dimensions. Decompression vents 56' are provided as shown which are determined by the buoyancy float dimensions. Two saddle trees 57 are provided to locate and fix the rear end of unit 50 to the road wheel axle carrier channel of the trailer. The front fish plate 51 is to attach the unit 50 to the trailer draw bar with a saddle arrangement.

The operation of the buoyancy unit 50 should be apparent from the description of the previous arrangement. The buoyancy unit 50 in this instance does not have releasably lockable casing portions surrounding each balloon 56.

Another embodiment of the present invention will now be described in which the trailer

itself does not include variable buoyancy means; this embodiment is suitable for heavier types of boat.

Figs. 10 and 11 show schematically an arrangement for launching a boat B into the water W, which arrangement includes a trailer T (which may be of a standard type) and variable support means 40. In order to launch the boat B a transport vehicle V may be reversibly driven to back the trailer T and boat B onto a launching pad or platform 41 of the variable support means 40. The variable support means 40 is shown in more detail in Fig. 11. Once the trailer T and boat B are correctly located on the platform 41 the trailer T may be uncoupled from the vehicle V.

A stop (not shown in Figs. 10 to 11) is provided to prevent the trailer T from running off the back of the launching platform 41 during launching of the boat B into the water W. Any support straps (not shown) which strap the boat B to the trailer T must be released so that the boat only rests on the trailer. In a modification of the platform 41 (see 41' in Fig. 14) cat-walks 41'a are provided so that it is easy to walk alongside the boat B while it is on the platform 41', in order to attend to releasing such support straps and/or to operate various controls of the variable support means 40.

While the variable support means 40 is not in use the platform 41 is supported in a generally horizontal position by a main support member 42 (see Figs. 10 and 12) mechanically connected to an actuating handle 43.

In order to launch the boat B into the water, pressure is first built up within expandable bellows arrangement 44 whilst the boat and trailer are on the platform 41 and the member 42 supports the platform; the pressurising medium in this case is air but any suitable pressurising medium and/or variable support means may be used, for example hydraulic rams. As shown in Figs. 9 and 10 the platform 41 is arranged to be pivotable about axis 45 close to, for example the quay-side and the bellows arrangement 44 is arranged spaced from axis 45 towards the end of, and underneath, the platform 41 so that during launching or indeed retrieval of the boat from the water the platform 41 is pivotable about axis 45 under control of bellows arrangement 44. Once the pressure inside the bellows arrangement 44 has been brought up to a sufficient level, which is detectable by a slight rising movement of the free end of the platform 41 the handle 43 may be actuated to release the main support member 42 leaving the boat B, trailer T and the platform 41 supported entirely by the bellows arrangement 44. The pressure control for the bellows arrangement 44 and/or the pressure source may be located at a distance from the launching site or alternatively located at the launch-

ing site. In the former case, the bellows arrangement may be independently controlled by an attendant or supervisor located some distance away from the launching site.

Additionally or alternatively, the release mechanism for the main support member 42 may be controlled by an attendant or supervisor at a distance from the launching site and any suitable means may be used to do this, for example electronic means. The main support member 42 may be replaced by any suitable locking mechanism which locks the platform 41 safely whilst not in use. The locking mechanism should also take account of rising and falling tides and should be such as to substantially avoid damage being done to variable support means 40 in the event of extreme weather conditions.

Once the main support member 42 has been released the launching platform 41 is supported only by the pressure in the bellows 44 the pressure is gradually reduced in the bellows so that it contracts and the platform 41 pivots downwardly about axis 45 until it reaches the position shown in Fig. 11. Thus the boat B is gradually lowered into the water and floats whilst the trailer T sinks. The boat B may be manoeuvred away from the launching platform 41 and the trailer T retrieved by increasing the pressure in the bellows arrangement 44, thereby raising the platform until it is horizontal; the trailer can then be coupled to the vehicle V, preferably after the main support member 42 has again been locked in place and the pressure in the bellows arrangement 44 reduced, and the trailer T can be driven off the platform 41 by the vehicle V.

It should easily be envisaged how the launching apparatus may be used to retrieve the boat B from the water W.

As shown in Fig. 12 the bellows arrangement 44 comprises two individual bellows which may, or may not be linked to a common pressure source. The upper surface of platform 41 is suitably shaped to receive and guide the wheels of the trailer T whilst the trailer is manoeuvred on and off the platform.

The launching apparatus may be of any suitable material or materials but of course will on the whole, be substantially non-corrosive. The frame-like structure of the variable support means 40 may be advantageous for spreading the load but the launching platform 41 itself need not be a frame-like structure (see Fig. 14) and also need not necessarily be arranged to tilt while lowering the boat into the water. Where convenient, for example where the quayside is square-edged rather than a slope (as shown in Figs. 10 and 11) the launching pad may be arranged to move vertically up and down.

Fig. 13 shows part of modified variable support means in which a single bellows unit 44' is employed. The remaining part of the modified variable support means 40' com-

prises platform 41' and this is shown in Fig. 14.

The variable support means shown in Figs. 13 and 14 includes restraining chains 46 to prevent the free end of platform 41' from being lifted to an excessive height. Fig. 13 shows a swivel plate 44'a for the bellows which can swivel as the bellows expand and contracts to take account of the inclination of the platform 44'.

The swivel plate 44'a may be located in a matching recess on the underside of the platform 41' and additional bellows may be employed if required with further matching recesses. 41c, designate an override stop for the arms 42'a of the main support member 42'. 41'd designates wheel guides.

Platform 41' is a plate rather than framework construction and the cat-walk portions 41'a are on either side of the boat and trailer location area 41'b. The trailer T and boat B may be backed onto the platform 41' between six vertically upstanding 'Sorbo' rubber guide posts 47 located as shown in Fig. 14. Stops 48 are provided to engage the trailer wheels and prevent the trailer from running off the back of the platform 41'.

Fig. 15 is a further modified platform 41'' which is not provided with cat-walks, but which functions in a similar manner to that previously described.

Fig. 16 shows a modified bellows 44' which is of tapered form.

Fig. 17 shows how a variably buoyant trailer may be used to recover a boat.

Fig. 18 shows a modification of launching apparatus in which the variable support means is at the launching site. Figs. 19 and 20 show constructional details.

In a further development means may be provided to hold the boat to the trailer temporarily during launching to avoid damage being done to the boat by relative movement of the boat and trailer. This means may take the form of strategically placed rubber vacuum suction cups, preferably located on the trailer and preferably linked to suitable vacuum producing means via appropriate piping.

The jet guidance system may use water as the pressurising medium instead of air.

CLAIMS

1. Apparatus for launching a boat into the water comprising a trailer for use in transporting the boat to and from a launching site, the trailer having variable support means or at least being supported by variable support means of the apparatus during launching, the arrangement being such that during launching the trailer is supported at a first level in the water by the variable support means and then lowered into the water, the variable support means being adapted to gradually give less support to the trailer and boat so that the trailer sinks leaving the boat floating on the

water, said apparatus also being utilisable to retrieve the boat from the water.

2. Apparatus as claimed in claim 1 in which the variable support means comprises variable buoyancy means on the trailer.

3. Apparatus as claimed in claim 1 in which the variable support means is located at a launching site.

4. Apparatus as claimed in claim 3 in which the variable support means has a launching pad or platform which, in use, supports the trailer and boat.

5. Apparatus as claimed in claim 4 in which the launching pad or platform is pivotable to lower the boat into the water or to retrieve it therefrom on the trailer.

6. Apparatus as claimed in claim 4 or claim 5 in which the variable support means has an expandible bellows arrangement for example, one or two bellows.

7. Apparatus as claimed in claim 6 in which the bellows arrangement is connected to a swivel plate and/or is of tapered form.

8. Apparatus as claimed in claim 6 or claim 7 in which the variable support means has a main support member which supports the pad or platform in the absence of any pressurising medium being supplied to the bellows arrangement.

9. Apparatus as claimed in any one of claims 3 to 8 in which means, for example chains, are provided to restrain the trailer from being raised above a preset level.

10. Apparatus as claimed in any one of claims 3 to 7 in which stops are provided for restraining the trailer from running off the variable support means during launching of the boat.

11. Apparatus as claimed in any one of claims 3 to 10 in which the variable buoyancy means is controlled entirely or in part from a location away from the launching site.

12. Apparatus as claimed in any one of claims 3 to 11 in which a pressure source for the variable buoyancy means is at a location away from the launching site.

13. A method of launching a boat into the water comprising transporting the boat on a trailer to a launching site and supporting the boat in the water during launching on the trailer, the trailer being supported by variable support means which is either carried on the trailer or located at the launching site, the variable support means being controlled to gradually giving less support to the boat and trailer so that the trailer sinks leaving the boat floating on the water.

14. A method of retrieving a boat from the water comprising manoeuvring the boat relative to a trailer which is submerged or partially submerged in the water, raising the trailer up underneath the boat by controlling variable support means to gradually give more support to the trailer and then to the boat until the boat and trailer are supported at a

first level and moving the trailer and boat together out of the water.

15. A trailer for use in transporting a boat to and from a launching site, said trailer comprising variable buoyancy means, the arrangement being such that the buoyancy of the trailer is capable of being raised to a first level so that the trailer will float with a boat thereon during launching of the boat into water, and during launching the buoyancy of the trailer is capable of being lowered from the first level so that the trailer sinks leaving the boat floating on the water, said trailer also being utilisable to retrieve the boat from the water by manoeuvring the trailer at or below said first buoyancy level under the boat.

16. A trailer as claimed in Claim 15 in which the variable buoyancy means comprises at least one buoyancy unit connected or connectable to a pressure supply system.

17. A trailer as claimed in Claim 16 in which the pressure supply system is to lead in air to the or each unit to increase the buoyancy of the trailer.

18. A trailer as claimed in Claim 17 in which the or each unit comprises at least one inflatable balloon or bag, for example, of rubber material.

19. A trailer as claimed in Claim 17 or 18 in which the pressure supply system is connectable to a compressor driven from a prime mover, for example a motorised vehicle engine.

20. A trailer as claimed in any one of Claims 16 to 19 in which several buoyancy units are provided and they are interconnected so that they may be pressurised dependently.

21. A trailer as claimed in any one of Claims 15 to 20 which is adapted with guide means to help guide the trailer and boat relative to one another.

22. A trailer as claimed in Claim 21 in which the buoyancy unit or units are configured to provide said guide means.

23. A trailer as claimed in Claim 21 or Claim 22 in which the guide means comprises or includes a jet guidance system.

24. A trailer as claimed in Claim 23 in which the jet guidance system comprises one or more directional control units operable independently of, or independently of part of, the buoyancy units.

25. A trailer as claimed in Claim 24 in which the or each directional control unit comprises a venturi tube.

26. A trailer as claimed in Claim 18 or any claim dependant therefrom in which the or each buoyancy unit comprises an outer casing, preferably, of rigid material, for example plastics, surrounding its respective inflatable balloon or balloons and delimiting the extent to which said balloon or balloons are inflatable thereby preventing the balloons from bursting.

27. A trailer as claimed in Claim 26 in

which the or each casing is split into at least two releasably-lockable portions.

28. A trailer as claimed in Claim 27 in which the releasable locking comprises one or more straps wrapped around the respective casing to strap the portions together.

29. A trailer as claimed in Claim 16 or any claim dependent therefrom in which location means may be provided to locate the or each buoyancy unit to the remainder of the trailer, for example, onto a frame member of the trailer.

30. A trailer as claimed in Claim 29 when dependent from any one of claims 26 to 28, in which the location means comprises a hole extending into the interior of the casing into which part of the trailer for example, a frame member may be inserted.

31. A trailer as claimed in Claim 29 in which the location means comprises fish-plates and saddle trees.

32. A trailer as claimed in Claim 16 or any claim dependent therefrom in which four buoyancy units are provided to receive the hull of a boat.

33. A trailer as claimed in any one of Claims 15 to 32 in which permanent buoyancy means such as plastics foam floats are provided on the trailer to give some measure of buoyancy to the trailer.

34. A trailer as claimed in Claim 33 in which the floats are included inside the buoyancy unit or units.

35. A trailer as claimed in Claim 26 or any claim dependent therefrom in which the casing has holes or valves for the ingress and exhaust of water near the or each inflatable balloon so that water may be used to aid or accelerate reduction in buoyancy of the trailer from said first level by pressurising the or each balloon externally and expelling air therefrom.

36. A trailer as claimed in Claim 35 in which the each buoyancy unit is provided with one or more connectors connecting the or each inflatable balloon to the pressure supply system and also securing the or each balloon to its respective casing.

37. A trailer as claimed in Claim 16 or any claim dependent therefrom in which the pressure supply system includes one or more valves such that once the trailer has been raised to said first level of buoyancy the valve or valves may be closed off, and opened again when required to reduce the buoyancy of the trailer.

38. A trailer as claimed in Claim 16 or any claim dependent therefrom in which the position of the buoyancy units relative to the remainder of the trailer may be adjustable so that selected portions of the trailer may be made variably buoyant.

39. A variable buoyancy unit which is capable of being attached to, for example, a boat trailer, said unit being connected or

connectable to a pressure supply system connectable to a pressure source so that the buoyancy or the unit may be raised on increase of the pressure from the pressure source, said unit comprising a shell or casing (for example two rigid casing portions releasably-lockable together) and at least one inflatable balloon securable or secured inside said shell or casing and capable of being inflated to outer dimensions restricted by the internal dimensions of the shell or casing.

40. A unit as claimed in Claim 39 in which releasably-lockable portions of the casing are configured to clamp onto a trailer or other piece of equipment as the portions are releasably locked together.

41. A unit as claimed in Claim 39 or 40 in which said unit is adjustable to allow some relative movement between the equipment and unit such as a sliding adjustment movement, so that a selected portion or portions of the equipment can be altered in buoyancy.

42. A unit as claimed in Claim 41 further comprising two inflatable balloons and one of which acts as a failsafe and on its own can be utilised to provide sufficient buoyancy, in the event of the other failing to inflate.

43. Means for launching a trailer mounted boat comprising a launching support platform mounted to lower a boat and trailer into the water, said platform preferably being pivotally mounted, said launching platform being part of a variable support means and said variable support means being arranged to gradually vary the support given to the trailer and boat during launching of the boat into the water, said variable support means being connected or connectable to a varying pressure supply, for example an air-pressure or hydraulic fluid supply.

44. A trailer substantially as herein described and illustrated with reference to Figs. 1 to 3 or substantially as modified with reference to Figs. 4, 5 or 6 of the accompanying drawings.

45. A trailer as claimed in Claim 15 comprising at least one buoyancy unit substantially as herein described and illustrated with reference to Fig. 2 or Fig. 9 of the accompanying drawings.

46. A trailer as claimed in Claim 15 comprising at least one directional control unit substantially as herein described and illustrated with reference to Figs. 7 and 8 of the accompanying drawings.

47. Launching apparatus as claimed in Claim 1 in which the variable support means is substantially as herein described and illustrated with reference to Figs. 10 to 12 and 21 or when modified substantially as shown in Figs. 13 or 14, or when modified substantially as shown in Fig. 15, or when modified substantially as shown in Fig. 16.

48. A method as claimed in Claim 13 substantially as herein described and illus-

trated with reference to the accompanying drawings.

49. A method as claimed in Claim 14 substantially as herein described and illustrated with reference to the accompanying drawings.

50. A buoyancy unit as claimed in Claim 39 substantially as herein described and illustrated with reference to Fig. 2 or Fig. 9 of the accompanying drawings.

CLAIMS

Amendments to the claims have been filed, and have the following effect:-

80 Claims 1-8, 10, 11, 13-48 and 50 above have been deleted or textually amended.

New or textually amended claims have been filed as follows:-

85 Claims 9, 12 and 49 above have been re-numbered as 7, 9 and 17 and their appendancies corrected.

1. Apparatus for launching a boat into the water comprising a trailer for use in transporting the boat to and from a launching site, the trailer being supported by variable support means of the apparatus during launching, said variable support means being located at a launching site, the arrangement being such that during launching the trailer is supported at a first level in the water by the variable support means and then lowered into the water, the variable support means being adapted to gradually give less support to the trailer and boat so that the trailer sinks leaving the boat floating on the water, said apparatus also being utilisable to retrieve the boat from the water and in which the variable support means has a launching pad or platform which, in use, supports the trailer and boat, the launching pad or platform being pivotable to lower the boat into the water or to retrieve it therefrom on the trailer, and in which at least one stop is provided for restraining the trailer from moving in a direction away from the pivot location of the pad or platform during launching of the boat.

2. Apparatus as claimed in Claim 1 in which the variable support means has an expandable bellows arrangement for example, one or two bellows.

3. Apparatus as claimed in Claim 2 in which the bellows arrangement is connected to a swivel plate and/or is of tapered form.

4. Apparatus as claimed in Claim 2 or Claim 3 in which the variable support means has a main support member which supports the pad or platform in the absence of any pressurising medium being supplied to the bellows arrangement.

5. Apparatus as claimed in Claim 4 in which the main support member is connected to an actuating handle.

6. Apparatus as claimed in Claim 4 or Claim 5 in which the main support member is

releasable by a control (for example an electronic control) located away from the launch site.

8. Apparatus as claimed in any one of the preceding claims in which the variable support means is controlled entirely or in part from a location away from the launching site.

10. Apparatus as claimed in any one of the preceding claims in which an upper surface of the pad or platform is shaped to receive and guide wheels of the trailer.

11. Apparatus as claimed in any one of the preceding claims comprising upstanding guide posts, for example of rubber.

12. Apparatus as claimed in any one of the preceding claims in which the pad or platform has cat walks.

13. A method of launching a boat into the water comprising transporting the boat on a trailer to a launching site and supporting the boat in the water during launching on the trailer, the trailer being supported by variable support means which is located at the launching site, the variable support means being controlled to gradually give less support to the boat and trailer so that the trailer sinks leaving the boat floating on the water and in which the trailer and boat are supported by a pivotable launching pad or platform of the variable support means, movement of the trailer being fixed relative to the launching pad or platform during launching of the boat and as the launching pad or platform is pivoted.

14. A method of retrieving a boat from the water comprising manoeuvring the boat relative to a trailer which is submerged or partially submerged in the water, raising the trailer up underneath the boat by controlling variable support means located at a launching site to gradually give more support to the trailer and then to the boat until the boat and trailer are supported at a first level and moving the trailer and boat together out of the water and in which the trailer and boat are supported by a pivotable launching pad or platform of the variable support means, movement of the trailer being fixed relative to the launching pad or platform until the boat and trailer are supported at said first level and the trailer is horizontal.

15. Means for launching a trailer mounted boat comprising a launching support platform mounted to lower a boat and trailer into the water, said platform being pivotally mounted, said launching platform being part of a variable support means and said variable support means being arranged to gradually vary the support given to the trailer and boat during launching of the boat into the water, said variable support means being connected or connectable to a varying pressure supply, for example an air-pressure or hydraulic fluid supply, said launching platform being provided with at least one stop for restraining the trailer from moving in a direction away from the

pivotal connection relative to the platform during launching of the boat.

16. Launching apparatus as claimed in Claim 1 in which the variable support means is substantially as herein described and illustrated with reference to Figs. 1, 1a, 2 and 3 or when modified substantially as shown in Figs. 4 or 5, or when modified substantially as shown in Fig. 6, or when modified substantially as shown in Fig. 7.

18. Means as claimed in Claim 15 substantially as herein described and illustrated with reference to the accompanying drawings.

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